FLUID POWERED BUBBLE MACHINE WITH SPILL-PROOF CAPABILITY

This application is a continuation of application Ser. No. 08/608,854 filed Feb. 29, 1996, which was a continuation-in-part of application Ser. No. 08/086,541 filed Jul. 1, 1993 and since issued Mar. 5, 1996 as U.S. Pat. No. 5,495,876 which was a continuation-in-part of application Ser. No. 07/828,345 filed Jan. 30, 1992 and since issued Sep. 21, 1993 as U.S. Pat. No. 5,246,046. The benefit of the filing date of this earlier filed application is claimed under 35 U.S.C. § 120.

BACKGROUND OF THE INVENTION

The present invention relates to improved machines for blowing bubbles as well as to improved machines for providing water spray for amusement. The invention has particular application for use with bubble solution of the type used by children in blowing bubbles.

It is well known that bubble machines have existed for some time and are commercially available in a variety of embodiments. Prior to applicant's co-pending application, and other applications by applicant which have matured into U.S. patents, these bubble machines have been of a type and geometry which provided no resistance to spillage of liquid contents of the machine. In addition, a variety of water toys have long existed that provide an amusing spray of water as well actuate movement of cartoon characters or cause the cartoon characters to spray water.

SUMMARY OF THE INVENTION

The present invention relates to an improved fluid powered bubble machine having various impellers, fans, axles and gear working in combination and wherein water from a source such as a garden hose activates the bubble machine to generate a continuous stream of bubbles. The machine can be used in combination with a sprinkler to generate both a stream of bubbles from one end on the machine, and a stream of water from the other end. In different embodiments of the present invention, selective channeling of the sprinkler portion of the bubble machine creates amusing and intermittent streams of water. In some instances, only the bubble portion of the machine is in use and the sole result is a pleasing, continuous stream of bubbles. In other instances, only the sprinkler portion of the machine is in use and the sole result is the generation of streams of water useful for either water play or for watering the lawn or other vegetation. In yet another embodiment, the water sprinkling portion of the apparatus has a non-fluid powered bubble machine, such as a battery powered bubble machine mounted on top. In its ideal use, both the sprinkler and bubble portion of the bubble machine are in use resulting in both a continuous stream of bubbles and streams of water, thereby maximizing the pleasure potential and utility of the invention.

In a preferred embodiment of the present invention, the fluid powered bubble machine comprises an impeller housing which encloses an impeller and which has a threaded opening for connection to a standard garden hose. On one side wall of the housing is another opening that forms a channel for providing fluid communication between the inner cavity of the housing and a fluid tank. Water flowing into the bubble machine from the garden hose or other water source flows past the impeller causing the impeller to act as a hydraulic motor which powers other portions of the bubble machine which are described below. In the preferred

embodiment, a hollow cylinder is provided for rotation within the fluid tank. The hollow cylinder rotates in response to torque from the hydraulic motor and causes a constantly changing portion of ports to be alternately open and closed. This, in turn, causes the water streams to be intermittent. Throughout the rotation cycle of the hollow cylinder, there are always one or more ports in the open position, so as to allow the water to flow continuously. After flowing past the impeller, the water flows into the hollow cylinder within the fluid tank and is ported out via a plurality of channels that guide the water into streams emanating radially outward and upward from the fluid tank.

On a second side wall of the impeller housing is a sealed, second opening for a geared axle. The axle is attached to the impeller at one end thereof, and is rotatably connected to a second impeller or fan. While the second impeller is not hydraulically ported to the hydraulic motor, torque from the hydraulic motor rotates the geared axle causing the second impeller to turn. Rotation of the second impeller generates an air stream. A bubble solution container is attached to the upper end of the bubble machine. The bubble solution container has an opening in the top surface and a funnel depending from the top surface into the inner cavity of the container. A bubble wheel, having bubble openings at the periphery of the bubble wheel, is positioned within the funnel and is rotatably connected to an extension of the geared axle. Rotation of the geared axle thus synchronously rotates both the second impeller and the bubble wheel. The diameter of the bubble wheel is sufficiently large such that an upper portion of the bubble wheel is continuously outside of the bubble container and is thereby exposed to the continuous air stream generated by the rotation of the second impeller. When a thin film of bubble solution adheres to the bubble openings at the periphery of the bubble wheel, the continuous air stream generated by the second impeller creates a continuous stream of bubbles.

Accordingly, in the preferred embodiment of the present invention wherein both the bubble machine and the sprinkler portion are in operation, it is an object of the present invention to provide a fluid powered bubble machine with spill-proof capability by connecting the lower impeller housing spout to a pressurized fluid or water source. The water will turn the impeller, exit the impeller housing through the upper impeller housing spout, enter the fluid tank through the fluid tank attach spout, fill and pressurize the fluid tank, exit through one or more aligned fluid passage holes and fluid passage slots, and create amusing streams of water. In response to the rotation of the impeller, the impeller forward gear will turn the fluid drum gear. Turning of the fluid drum gear will cause various fluid passage holes and fluid passage slots to constantly align and misalign in a predetermined or random pattern. The rotating rearward impeller gear will cause the coupled female fan gear and fan to rotate. Rotation of the fan creates an air stream directed at the bubble wheel. Rotation of the fan, fan axle, and male fan gear also causes rotation of the bubble wheel through the bubble trough. A plurality of bubble orifices placed on the outer periphery of the bubble wheel thus rotates into the bubble trough, picks up a thin film of bubble solution, continues its rotation within the rectangular funnel until the bubble orifices are protruding outside of the container. The air stream "blows" bubbles with the bubble film thereby vacating the bubble orifices. Continued rotation of the bubble wheel results in a continued exposure of bubble film to the air stream.

DESCRIPTION OF DRAWINGS

The objects and many attendant advantages of this invention will be readily appreciated and become readily apparent

as the same becomes better understood by reference to the following detailed description, when considered in conjunction with the accompanying drawings and in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. **1** is an isometric assembly view of the bubble machine (rotated 90 degrees counterclockwise to facilitate a larger scale figure). The front right portion of the solution container shells, lower impeller housing, and fluid tank are shown cut away. The right portion of the upper impeller housing and fluid drum (except for part of the fluid drum gear) are also shown cut away.

FIG. **2A** is an exploded isometric view of the various parts that make up the bubble machine and illustrates their relationship to each other. The portions shown cut away, are identical to that shown in FIG. **1**.

FIG. **2B** is an enlarged view of the bubble machine base shown in FIG. **2A**.

FIG. **2C** is an enlarged view of the fluid tank shown in FIG. **2A**.

FIG. **4** is a sideways oriented enlargement of the bubble solution container portion of the bubble machine of FIG. **3**. The bubble solution is shown retained in the top of the upper shell.

FIG. **5** is an inverted enlargement of the bubble solution container portion of the bubble machine of FIG. **3**. The bubble solution is shown retained in the front portions of the upper and lower container shells.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to facilitate the understanding of the present invention in reviewing the drawings accompanying the specification, a feature list is provided below. It is noted that like features are like numbered throughout all of the figures.

FEATURE TABLE

Number	Feature	Number	Feature
10	Bubble machine assembly	74	Impeller forward axle
12	Forward end of assembly	76	Impeller rearward axle
14	Rearward end of assembly	78	Impeller blade
20	Bubble machine base	80	Fan
22	Attach pin - machine base	82	Fan axle
24	Attach pin - machine base	83	Rearward retaining flange - fan axle
26	Attach pin - machine base	84	Forward retaining flange - fan axle
30	Fluid tank	86	Male fan gear
32	Fluid passage hole - fluid tank	87	Female fan gear
34	Attach receptacle - fluid tank	88	Fan blade
35	Attach spout - fluid tank	90	Bubble Wheel
36	Attach spout rearward edge - fluid tank	92	Bubble surface
38	Attach spout outer surface - fluid tank	94	Bubble wheel axle
40	Fluid drum	96	Retaining flange - bubble wheel
41	Fluid drum open end	98	Bubble wheel gear
42	Fluid drum gear	100	Lower solution container shell
44	Inner gear surface - fluid drum	102	Bubble solution trough - lower shell
46	Fluid passage slot - drum fluid	104	Connecting flange - lower shell
50	Lower impeller housing	106	Attach receptacle - lower shell
52	Attach receptacle - lower impeller housing	108	Fill line
54	Spout - lower impeller housing	110	Upper solution container shell
56	Axle retaining slot - lower impeller housing	112	Funnel - upper shell
58	Stop - lower impeller housing	114	Funnel upper opening - upper shell
60	Upper impeller housing	116	Funnel lower opening - upper shell
61	Upper impeller housing spout	118	Axle retaining slot - funnel
62	Stepped spout edge - upper impeller housing	120	Connecting flange - upper shell
64	Outer spout surface - upper impeller housing	122	Fan axle trough - upper shell
66	Axle retaining slot - upper impeller housing	124	Forward fan axle retaining flange - upper shell
68	Stop - upper impeller housing	125	Rearward fan axle retaining flange - upper shell
70	Impeller	126	Upper shell fill spout
71	Impeller forward gear	130	Cap
72	Impeller rearward gear	140	Bubble solution level

FIG. **2D** is an enlarged view of the fluid drum shown in FIG. **2A**.

FIG. **2E** is an enlarged view of the impeller housings and impeller shown in FIG. **2A**.

FIG. **2F** is an enlarged view of the fan and bubble wheel shown in FIG. **2A**.

FIG. **2G** is an enlarged view of the solution container shells shown in FIG. **2A**.

FIG. **3** is an orthographic side view of the bubble machine. The portions shown cut away are the same as in FIG. **1** except that the bubble drum gear is not cut away. The bubble solution is shown retained in the bottom of the lower shell.

Referring now to the drawings and particularly to FIGS. **1** and **2**, the invention is a machine **10** that comprises a base **20**, a fluid tank **30**, a fluid drum **40**, a lower impeller housing **50**, an upper impeller housing **60**, an impeller **70**, a fan **80**, a bubble wheel, a lower solution container shell **100**, an upper solution container shell **110**, and a cap **130**. The machine **10** has a forward end **12** and a rearward end **14**. Base **20** comprises a support base with a plurality of attach pins **22**, **24**, and **26**. The preferred embodiment of the present invention will now be described by further reference to the figures.

As can be seen from FIG. **2C**, fluid tank **30** contains a plurality of fluid passage holes **32**, an attach receptacle **34**, and an attach spout **35**. Attach receptacle **34** is adapted to

snappingly attach to and be supported by attach pin **22**. Rearward edge **36** of attach spout **35** bears against the impeller housing stepped edge **62**, and the inner surface **38** of attach spout **35** connects with outer surface **64** of upper impeller housing spout **61**.

FIG. 2D shows fluid drum **40** having an open end **41**, a gear **42**, an inner gear surface **44**, and a plurality of fluid passage slots **46**. Fluid drum **40** is adapted to reside on and rotate about fluid tank **30**. The inner gear surface **44** is adapted to allow attach spout **35** and attach spout **61** to be in coupling engagement within and to pass through the inner gear surface **44**.

As can be seen from FIG. 2E, an impeller housing is defined by a lower impeller housing **50** and an upper impeller housing **60**. Lower impeller housing **50** is further defined as having an attach receptacle **52**, a spout **54**, an impeller axle retaining slot **56**, and a stop **58**. The attach receptacle **52** is adapted to snappingly attach to and supported by attach pin **24**. Upper impeller housing **60** is further defined as having a spout **61**, a stepped spout edge **62**, a spout outer surface **64**, an axle retaining slot **66**, and a stop **68**. The lower impeller housing **50** and the upper impeller housing **60** are adapted to snappingly engage one to another to form a complete impeller housing.

As can also be seen from FIG. 2E, an impeller **70** has a forward gear **71**, a rearward gear **72**, a forward axle **74**, a rearward axle **76**, and a plurality of impeller blades **78**. Impeller **70** is adapted to be retained by and be rotatable within lower impeller housing **50** and upper impeller housing **60** when the impeller housings are in coupling engagement with one another by means of the impeller axles **74** and **76** being retained by axle retaining slots **56** and **66**.

As shown in FIG. 2F, a fan **80** is provided having fan axle **82**, a rearward fan axle retaining flange **83**, a forward fan axle retaining flange **84**, a male fan gear **86**, a female fan gear **87**, and a plurality of fan blades **88**.

Also shown in FIG. 2F, a bubble wheel **90** has a plurality of bubble orifices **92** about the outer periphery, a bubble wheel axle **94** at the center, at least one bubble retaining flange **96** on the end of the bubble wheel axle **94**, and a bubble wheel gear **98**. The male fan axle **86** is adapted to mesh with and provide torque to bubble wheel gear **98**.

FIG. 2G shows a bubble solution container having a lower solution container shell **100** and an upper solution container shell **110**. The lower solution container shell **100** is further defined as a shell having a bubble solution trough **102**, a connecting flange **104**, an attach receptacle **106**, and a fill line **108**. The attach receptacle **106** is adapted to snappingly attach to and supported by base attach pin **26**.

As is also shown in FIG. 2G, the upper solution container shell **110** is further defined as a shell having a funnel **112**, a upper funnel opening **114**, a lower funnel opening **116**, bubble wheel axle retaining slots **118**, a connecting flange **120**, a fan axle trough **122**, fan axle retaining flanges **124** and **125**, and a filling spout **126**. The lower solution container shell **100** and upper solution container shell **110** are adapted snappingly attach together by connecting flanges **104** and **120**. The fill spout **126** is adapted to threadingly attach to a cap **130**. The bubble wheel axle retaining flange **118** is adapted to snappingly attach to and support rotation of the bubble wheel axle **94**. The fan axle retaining slots **124** and **125** are adapted to snappingly attach to and support rotation of fan axle **82**.

The operation of the present invention can be seen by reference to FIG. 1. When a pressurized fluid source is connected to the lower impeller housing spout **54**, the fluid will cause the impeller **70** to rotate by creating a pressure differential on the impeller blades. As impeller **70** rotates, male impeller gear **72** that is coupled to female fan gear **87** causes the fan **80** to rotate. The rotation of impeller **70** also causes impeller forward gear **71** which is meshed with fluid drum gear **42** to rotate the fluid drum. The rotation of fan **80** causes fan blades **88** to generate an air flow in the direction of bubble wheel **90**. As fan **80** rotates, male fan gear **86** that is meshed with bubble wheel gear **98** causes bubble wheel **90** to rotate. The rotation of bubble wheel **90** causes bubble orifice **92** to continuously travel through and be immersed in bubble solution in bubble solution trough **102**, to travel above funnel upper opening **114**, and to expose refreshed bubble orifice **92** to the air stream, thus creating bubbles. After entering through lower impeller housing spout **54** and rotating impeller **70**, the pressurized fluid exits upper impeller housing **60** through upper impeller housing spout **61** and simultaneously enters fluid drum **30** through fluid drum attach spout **35**.

After entering and pressurizing fluid tank **30**, the fluid exits the fluid tank through one or more fluid passage holes **32** and through one or more fluid passage slots **46** and sprays outward. Fluid tank **30** and fluid drum **40** are adapted such that at any given point in the bubble creation cycle and the fluid flow and spray cycle, at least one fluid passage hole **32** and at least one fluid passage slot **46**, will always be lined up with one another so to create a constant fluid flow path.

As can be seen by reference to FIG. 2, bubble wheel gear **98** has a diameter less than the diameter of the bubble wheel **90**. The bubble wheel **90** is prevented from inadvertently becoming detached from bubble wheel axle retaining slots **118** by bubble wheel axle retaining flanges **96**. Retaining flanges **96** also act to keep bubble wheel **90** from rubbing against the sides of funnel **112**. Bubble solution is poured into the interior of upper container shell **110** through fill spout **126** to a predetermined level as indicated by fill line **108**. The maximum fill line **108** is placed no higher on lower shell **100** than to equal the volume defined by the maximum liquid that can be held in the machine without running out of funnel **112** when oriented in any position.

FIGS. 3–5 illustrate the additional unique advantages of spill resistance when fluid is filled at or below the fill line **108** in the subject invention regardless of the various possible orientations. As is apparent from FIG. 3, when the invention is in the upright position liquid will always be below the lower edge **116** of funnel **112**. When machine **10** is in the upside down position as in FIG. 4, the liquid will occupy the space immediately around funnel **112** but not be able to enter funnel **112** for discharge through opening **114**. When machine **10** is in a sideways position as in FIG. 5, the liquid level will always be between the side of the funnel **112** and the lower side of the two container shells **100** and **110**. Furthermore, when the machine **10** is oriented in any of an infinite variations of the above described positions, it will behave in a like manner and prevent the spillage of the solution.

As is seen by reference to FIGS. 1 and 2, in the preferred embodiment, the fluid powered bubble machine of the subject invention is mounted on a base with bubbles being blown from one end and fluid emanating from the other. However, other embodiments of the subject invention could readily be adapted to have the fluid emanate from a vertical fluid tank and the bubble blowing portion of the machine could be mounted above the fluid tank so as to increase the elevation of the bubbles being blown. The entire machine could also be readily adapted to take the from of a fire hydrant, a cartoon character, or other aesthetically pleasing shape.